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CASE REPORT

Cedar Pollen Aggravates Atopic Dermatitis in Childhood Monozygotic Twin Patients with Allergic Rhino Conjunctivitis

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ABSTRACT

We report a case of 7-year-old monozygotic twin patients with atopic dermatitis. The HLA haplotypes were HLA A2, A11, B27, B61, DR1, and DR4. Both serum IgE levels and cedar pollen radioallergosorbent test (RAST) scores were high in the twins (elder/younger sister: IgE: 5170/3980 IU/ml and Japansese cedar pollen: >100/64.0) in contrast to low mite and food RAST scores (Dermatophagoides Pterygonium; 0.59/0.4 and egg white 9.24/4.6). The patients showed positive immediate (20 min in both sisters) and delayed (24 hours in elder sister, 24, 48, 72 hours in younger sister) reactions to a scratch test with Japanese cedar pollen. Skin lesions on the face were aggravated and extended to the trunk and extremities during the Japanese cedar pollen season and gradually subsided in summer. Oral provocation with egg white or cow milk showed no exacerbations, and topical corticosteroid did not improve the eczema. In contrast, successful protection from severe scratching behaviors was achieved by use of topical anti-allergic eye drops and wearing nightgowns made by the mother.

KEY WORDS

atopic dermatitis, cedar pollen, childhood, monozygotic twins, scratching behavior

INTRODUCTION

Since Besnier's first description in 1892, atopic dermatitis has been recognized as a representative, multi-factorial allergic disease influenced by genetic factors.[1] When both parents show atopic eczema, the children have a high risk (-70%) of developing eczema.[2] Monozygotic twins run a risk of 0.86 of having atopic dermatitis if either twin has the disease, whereas the disease risk of 0.21 by dizygotic twins does not differ from the frequency seen in ordinary brothers and sisters.[3] Dry skin, immunological dysfunction, increased IgE production, or an autonomous nervous system imbalance are frequently observed in patients with atopic dermatitis, along with bronchial asthma or pollenosis, which have closely related genetic factors.

In 2006, Palmer *et al.* reported that common loss-of-function variants of the epidermal barrier protein filaggrin are major genetic factors for the risk of atopic dermatitis. Subsequently, these mutations have also been linked to atopic dermatitis,[4-6] asthma,[7-9] and allergy.[10] Environmental factors initiate allergic diseases by penetrating barrier-disrupted skin. Our current monozygotic twin case shows aggravation of facial skin lesions during the cedar pollenosis season, followed by severe scratching behavior resulting in eczema. In contrast to the high IgE-RAST scores of various pollen allergens with aggravation of eczema, RAST scores for mites and food antigens were low, and a challenge test of several foods with positive RAST scores did not affect eczema. Successful protection from severe scratching behaviors was achieved with use of topical anti-allergic eye drops and wearing nightgowns hand-made by their mother.

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CLINICAL SUMMARY

Seven-year-old monozygotic twin sisters visited our outpatient clinic with severe eczema. Both patients suffered from neonatal melena, mental retardation, and atopic dermatitis, and had been treated for atopic dermatitis. Their mother had suffered from atopic dermatitis since childhood.

The twins were delivered by normal birth, but were given a whole blood transfusion due to newborn melena of unknown origin. Soon after birth, they developed skin lesions, which gradually worsened during the cedar pollenosis season. Severe uncontrolled scratching behaviors were observed in both patients, and skin lesions extended over their whole body in a similar distribution. Their scratching behaviors were uncontrolled due to mental retardation, possibly related to newborn melena. Several food intake tests did not affect the exacerbation of the eczema.

At the first visit, crusted and lichenified eczematous lesions were observed, especially around the periorbital region and the trunk skin (Fig. 1A-D). A diagnosis of atopic dermatitis was made according to the diagnostic criteria proposed by the Japanese Dermatological Association.[11] Monozygosity was confirmed by the patients' similarity and birth record, and their HLA haplotypes were HLA A2, A11, B27, B61, DR1, and DR4. Both serum IgE levels and Japanese cedar pollen RAST scores were high in the twins (elder/younger sister; IgE: 5170/3980 IU/ml and cedar pollen: >100/64.0) in contrast to low mite and food RAST scores (Dermatophagoides Pterygonium: 0.59/0.4, egg white: 9.24/4.6, egg yolk: 1.76/0.77, soybean: 35.5/4.3, cow milk: 5.63/0.44, rice: 14.3/5.0, and wheat 12.7/4.4). Information obtained by questioning the patients raised the possible involvement of mugwort, benzalconium chloride, and ε-aminocapronic acid in developing facial eczema. Although these compounds are tested by patch test which was difficult for them to complete for 48 hours due to mental retardation, we adopted prick test method. The patients showed positive immediate (20 min in both sisters) and delayed (24 hours in elder sister, 24, 48, 72 hours) reactions to a skin prick test with Japanese cedar pollen (Fig. 2A-C).

During the pollen season, both patients showed pollenosis symptoms including sneezing and eye congestion with elevated lacrymal flow and uncontrolled scratching on the face, followed by aggravation of the atopic dermatitis.

Topical glucocorticoid or antihistamines failed to suppress the scratching behaviors or exacerbation of eczema. However, after using overall -type nightgowns made by their mother (Fig. 3) and anti-allergic eye drops, worsening of the skin lesions during the cedar pollen season was prevented, and laboratory scores improved. IgE titer (elder: 5170 to 1749 IU/l, younger 3980 to 656 IU/l) was improved after the therapy and protection.

Fig. 1 Clinical features of identical twin sisters with atopic dermatitis. Note the result of severe scratching dermatitis around in the periorbital regions. **A, B.** Periorbital lesions (left; elder sister, right; younger sister). **C, D.** Trunkal lesions (left: elder sister, right: younger sister).

DISCUSSION

In 2006, Palmer *et al*. reported that common loss-of-function variants of the epidermal barrier protein filaggrin are major genetic factors for the risk of atopic dermatitis.[5] Subsequently, these mutations have also been linked to atopic dermatitis,[4-6] asthma,[7-9] and allergy.[10] Environmental factors initiate allergic diseases by penetrating barrier-disrupted skin. Our current twin cases of atopic dermatitis showed similar clinical manifestations, including aggravation of facial skin lesions during the cedar pollen season, followed by severe scratching behavior resulting in generalization of eczema and hyposensitivity to food allergens. In the recent literature, the prevalence rate of pollenosis in childhood has been increasing,[12] especially in children bearing filaggrin mutations.[7] Masuda *et al*. recently reported that the ratio of cedar pollenosis sensitization gradually increases from infancy to adolescence. In their survey,

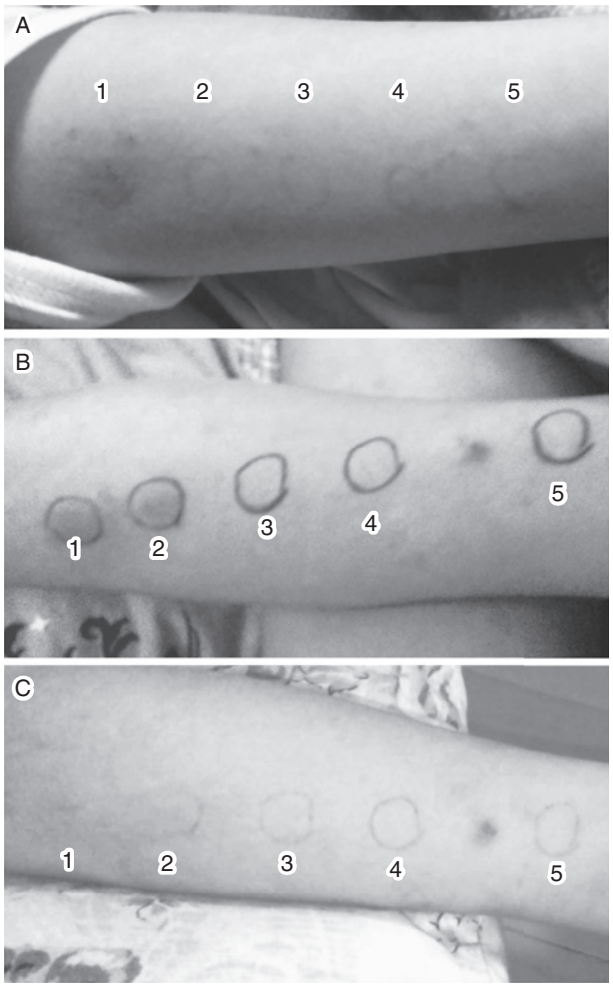

Fig. 2 Positive skin reaction to Japanese cedar pollen prick test. **A.** Skin reaction at 72 hours (younger sister) after positive immediate reaction. Note indurated erythematous reaction. **B.** Skin reactions at 15 minutes (elder sister). **C.** Skin reaction at 24 hours (elder sister). 1, Japanese cedar pollen. 2, Mugwort. 3, Benzalconium chloride. 4, εAminocapronic acid. 5, Control.

the youngest child sensitized to Japanese cedar pollen was a 23-month-old boy with atopic dermatitis.[13] Kusunoki *et al*. reported that the prevalence of cedar pollenosis is 5.2% in school-age children and higher in older children. Kusunoki *et al*. also demonstrated that among children with atopic dermatitis, there was a statistically significant correlation between the severity of atopic dermatitis and the presence of cedar pollenosis, and children with cedar pollenosis tended to have more severe atopic dermatitis symptoms. On the other hand, the severity of bronchial asthma was not affected by the presence of cedar pollenosis, which suggests a possible contribution of cedar pollen to atopic dermatitis but not to bronchial asthma symptoms.[14] In contrast to high IgE-RAST scores of various pollen allergens with aggravation of eczema,

Fig. 3 Hand-made overall nightgown that directly prevents scratching.

RAST scores for mites and food antigens were low, and challenge tests of several foods with positive RAST scores did not affect eczema.

We previously reported that exposure to Japanese cedar pollen induces airborne contact dermatitis in Japanese individuals.[15-17] Exacerbation of atopic dermatitis lesions is occasionally observed after contact with airborne antigens during the pollen season.[15,16] The clinical features of airborne contact dermatitis related to cedar pollenosis usually include a characteristic appearance affecting the face and hands. The eruption frequently has a sharp demarcation at the mid-bicep level and the upper sternal V line.[16,17] Although cedar pollen dermatitis is not currently well recognized, our report and the reports of others suggest that cedar pollen is responsible for aggravation of atopic dermatitis in adult patients. However, no childhood cases have been reported in Japan.

Our current twin cases showed both high RAST score of cedar pollen and gave positive reactions to a scratch test with cedar pollen in younger sister. During the cedar pollenosis season, both twins showed pollenosis symptoms, including sneezing and eye congestion with elevated lacrymal flow and uncontrolled scratching on the face followed by aggravation of the atopic dermatitis. At present, it is very difficult to conclude whether cedar pollen directly or indirectly related to trunk lesions. Both mechanisms might be worked in the present cases.

Anti-allergic eye drops were very effective at preventing the scratching behavior along with the daily use of hand-made nightgowns, which restrains scratching directly. In addition to protective effect of cotton made-night wear from scratching, it is conceivable that it also prevent the contact with environmental factors.

It is now well recognized that barrier dysfunction and food sensitivity are the major aggravating factors in childhood atopic dermatitis.[7] However, even in childhood, appropriate diagnosis and management of

pollenosis are required to control and prevent the progression of atopic dermatitis.

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